REMARKS

Claims 35-37, 41 and 43 have been canceled, and new claim 46 has been added. No new matter was added. Thus, claims 30, 32, 38-40, 42 and 44-46 are pending for further prosecution. Independent claim 30 has been amended to distinguish over the prior art of record. No new matter was added. Accordingly, Applicant respectfully submits that the present application is in condition for allowance.

I. Claim Rejections - 35 USC §112, second paragraph

> *In the non-final Office Action dated August 14, 2009, claims 36-38 are rejected under 35 USC §112, second paragraph, as being indefinite.*

Claim 36 has been canceled. Accordingly, Applicant respectfully submits that this rejection is now moot and can be withdrawn.

II. Claim Rejections - 35 USC §103(a)

> *In the non-final Office Action dated August 14, 2009, claims 30, 32 and 35-45 are rejected under 35 USC §103(a) as being obvious over U.S. Patent No. 6,331,233 B1 issued to Turner.*

The term "forging" is known by one of ordinary skill in the art to refer to a step of shaping metal by applying localized compressive force to a metal ingot or billet. There are many different types of forging. For example, "cold" forging refers to forging performed at or near room temperature. In addition, "extend" forging, "upset" forging, and "mix" forging also refer to different types of forging.

The phrase "cold <u>extend</u> forging" refers to forging accomplished at or near room temperature in which the diameter of the ingot or billet is reduced. For example, the thickness or

length of a cylindrical cast ingot or billet subjected to a cold extend forging process is increased by such a process; while, the diameter of the ingot or billet is reduced. By way of example, extend forging can be accomplished by rolling the ingot or billet along a lengthwise direction to reduce its diameter and "extend" (i.e., draw) its length or thickness. Another example of extend forging is to squeeze the ingot or billet with force into and/or through a die of lesser diameter to reduce the diameter of the ingot or billet. Accordingly, "cold extend forging" is a process in which the diameter of the ingot or billet is reduced. For example, see page 7, lines 16-23, of the present application, as filed, in which a cast ingot or billet having a diameter of 200mm is subjected to "cold extend forging" such that the diameter of the ingot or billet is reduced to 100mm as a result of the cold extend forging.

Upset forging is forging applied in a different direction as that applied with extend forging. During upset forging, forces are applied to "flatten" the ingot or billet such that the thickness or length of the ingot or billet is reduced while the diameter is enlarged. Thus, upset forging accomplishes the opposite of that of extend forging.

Cold mix forging, also referred to as cold cross forging, is a process in which the ingot or billet is worked in more than one direction. Mix forging makes the resultant properties of the ingot or billet more isotropic (i.e., equal in three directions) and is typically accomplished by upsetting (i.e., flattening) and then extending (i.e., redrawing) the ingot or billet. By way of example, on page 7, lines 24-28, of the present application, as filed, "cold mix forging" is used on an ingot or billet having a diameter of 100mm (as a result of cold extend forging an ingot or billet having a cast diameter of 200mm) and, at the conclusion of the "cold mix forging" process, the diameter is 100mm. Thus, an equal amount of upsetting (flattening) and extending (redrawing) is applied.

Turning to independent claim 30 of the present application, it has been amended to require the steps of forming (melting/casting) a Ta ingot or billet of a predetermined diameter and then cold extend forging the ingot or billet such that the predetermined diameter of the ingot or billet is reduced. No new matter was added. For example, see page 7, lines 16-23, of the present application, as filed.

In addition, independent claim 30 has been amended to require a "cold mix forging" step and then a "further cold mix forging step". No new matter was added. For example, see page 7, lines 24-28, of the present application, as filed, for the cold mix forging step and see page 7, lines 29-30, for the further cold mix forging step. (Also, with respect to the subject matter recited in new dependent claim 46, see page 7, lines 21-28, of the present application, as filed.)

In the Office Action, the following statements are made with respect to the disclosure provide by the cited prior art reference, Turner, relative to the limitations formerly stated in dependent claims 35 and 36 of the present application:

> "Turner ('233) does not specify that the forging would be cold extend forging ... Tuner ('233) encompasses all types of forging"; and
> "Turner ('233) does not specify that the forging would be cold mix forging ... Tuner ('233) encompasses all types of forging".

Applicant agrees that Turner fails to disclose extend forging and mix forging steps; however, Applicant respectfully disagrees that the disclosure provided by Turner "encompasses all types of forging". Accordingly, reconsideration and removal of the above referenced obviousness rejection based on Turner is respectfully requested.

Turner teaches to one of ordinary skill in the art the use of no less than three "deformation steps" from "ingot to final target plate thickness in order to achieve the desired results" (see column 4, lines 19-21, of Turner) and to produce significant "thickness reduction" (see column 3, lines 53-54, of Turner). More specifically, Turner requires that no less than about

40% reduction “from starting thickness to final thickness” be accomplished with a first deformation step (see column 4, lines 3-4, of Turner). Thereafter, the “resulting billet/plate is then deformed no less than an additional 35%, preferably 45-65%, of its thickness” (see column 4, lines 8-10, of Turner). Thereafter, the process requires an “additional deformation step with a strain >60%” (see column 4, lines 13-14, of Turner).

Turner states that “FIG. 3 is a schematic of the invented process” and that the “deformation directions” shown in FIG. 3 are required to achieve the “desired results”. See FIG. 3 and column 3, lines 24-25, and column 4, lines 16-18, of Turner. FIG. 3 of Turner clearly shows that a cylindrical Ta ingot is flattened (i.e., via upset forging in which a compressive force is applied to reduce thickness/length and increase diameter) in “Deformation Stage 1”. Thereafter, the flattened ingot is further flattened (i.e., vie additional upset forging) in “Deformation Stage 2” in which a compressive force is applied in the same direction as “Deformation Stage 1”. Thereafter, the twice flattened ingot is further flattened (i.e., vie additional upset forging) in “Deformation Stage 3” in which a compressive force is applied in the same direction as “Deformation Stages 1 and 2”.

Accordingly, Turner clearly fails to disclose a process utilizing a first “cold extend forging” step and then a pair of “cold mix forging” steps. Applicant respectfully submits that Turner teaches away from the specific forging steps required by claim 30 of the present application. For example, Turner teaches the use of three upset forging steps in which the compressive force applied to the ingot billet is the same and in the same direction in each deformation step. Thus, Applicant respectfully submits that the present invention and Turner employ considerably different forging methods.

The forging method of the present invention is characterized in conducting “extend forging” in advance. As discussed above, one of ordinary skill in the art is aware that the term

"extend forging" refers to working (i.e., rolling in a lengthwise direction or squeezing through a die press) such that the diameter of the ingot/billet is reduced (not enlarged). It is necessary to increase the processing amount (processing rate) of deformation processing as much as possible to obtain uniformity and refinement of the crystal structures of the metal material of the present invention and it is also necessary to select the subsequent heat treatment condition to inhibit coarsening of crystal grain size. Thus, as a result of increasing the ingot thickness in advance by "extend forging", the present invention enables the subsequent forging steps to be performed with the largest possible processing amount (processing rate). It is therefore possible according to the present invention to obtain a Ta target having a uniform and fine crystal grain structure. Furthermore, since forging with a large processing amount (processing rate) can effectively accumulate stress in the ingot, it is possible to eliminate wrinkle shaped defects.

In contrast, the three upset forging steps of Turner simply progressively decrease the thickness of the ingot. This eliminates any opportunity to forge the metal with a large processing amount (processing rate) and makes it substantially impossible to obtain a uniform crystal grain structure comparable to that of the present invention.

For the above reasons, Applicant respectfully submits that independent claim 30, as amended, is patentable and is not obvious in view of Turner. Accordingly, Applicant respectfully requests reconsideration and removal of the above referenced rejection.

III. Conclusion

In view of the above amendments and remarks, Applicant respectfully submits that the claim rejections have been overcome and that the present application is in condition for allowance. Thus, a favorable action on the merits is therefore requested.

Please charge any deficiency or credit any overpayment for entering this Amendment to our deposit account no. 08-3040.

Respectfully submitted,
Howson & Howson LLP
Attorneys for Applicants

By /William Bak/
William Bak
Reg. No. 37,277
501 Office Center Drive
Suite 210
Fort Washington, PA 19034
(215) 540-9216